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ones of *Lithospermum canescens* Lehm., we may see how far *L. longiflorum* is from showing dimorphism:

Plant Nos.	Flower Nos.	Length of Corolla Tube.	Height of Anthers.	Height of Stigma.	Pollen.
Plant No. 1	1	7.8 mm.	6.8 mm.	2.8 mm.	Pollen grains ovoidal, slightly constricted in the middle. .019 × .03 mm.
"	2	8.1 "	7.1 "	2.5 "	
"	3	7.6 "	6.6 "	2 8 "	
Plant No. 2	4	9.6 "	7.3 "	3.0 "	
Plant No. 3	5	6.8 "	2.8 "	7.6 "	Pollen grains oblong, much constricted in the middle. .01 × .019 mm.
"	6	7.8 "	2.5 "	6.8 "	
"	7	8.6 "	2.7 "	7.3 "	
"	8	8.6 "	2.7 "	7.3 "	
"	9	8.6 "	2.7 "	7.3 "	

These measurements are entered upon the diagram (Plate) at the lower left hand corner, upon the same scale as those of *L. longiflorum.*

The following facts are clearly shown above in the case of *L. longiflorum:*

1st. The length of the corolla is exceedingly variable.

2d. The distance from the anthers to the top of the corolla tube is approximately uniform, so that the position of the anthers is largely dependent upon the length of the corolla tube.

3d. The length of the style is even more variable than that of the corolla tube.

Have we here a case of incipient heterostyly; or has this species but recently (since falling into cleistogamy) abandoned its former heterostylous form and habits? Probably there is some connection between the cleistogamy of the later flowers and the irregularity of the earlier ones.

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NOTICE OF SOME AQUATIC WORMS OF THE FAMILY NAIDES.

BY PROF. JOSEPH LEIDY.

THE little worms of the family of Naides, comprising the genera Nais, Pristina, Stylaria, Dero, Æolosoma, Aulophorus, Chætogaster, etc., are common in ponds, ditches and other quiet waters, mostly living among various aquatic plants, or in the superficial sediment. They have always been viewed with special interest from their conspicuously exhibiting the process of multiplication through division, often being seen in a string of

from two to four individuals together. From the want, in many cases, of sufficiently complete descriptions and accurate representations of the European forms, there is more or less uncertainty how far ours may agree with or differ from them.

Among our Naides I have observed several species pertaining to or nearly allied with the singular genus Dero. One of these, formerly described under the name of *Dero limosa* (Proc. Acad. Nat. Sci., 1857, 226), appears to accord so closely with the European species, *Dero digitata* of Oken, that better means of comparison may prove it to be the same. The latter, originally described and figured by Müller upwards of a century ago, "as the blind Naiad"—"*die blinde Naide*" (Von Würmen, Kopenhagen, 1771, 90, 95, Tab. v, Fig. 1–3) is represented with the body of the worm ending in a broad funnel-like pavilion opening obliquely upward and furnished with four pairs of divergent rays, successively increasing in length from before backward. Another European species, described by Udekem as *Dero obtusa*, is represented with two pairs of rays to the caudal pavilion (Bul. Acad. Sci. Belgique, 1855, 549; Mem. Acad., 1859, 18), and is likewise so described by Perrier (Archiv. Zool. Exp., Paris, 1872, 65). Semper has more recently described two species, *Dero rodriguezii* and *D. philippinensis*, which differ from the preceding and each other in the character of the caudal pavilion (Arbeit. Zool. Inst., Wurzburg, 1877, 106, 107).

Dero limosa is frequent, and is to be found creeping among aquatic plants or on the sides of the vessel containing the water in which they have been collected, or it may be observed partly buried in sediment, projecting from a short chimney of its own construction, rising above the surface of the sediment, and with the caudal pavilion expanded.

The characters of the worm are as follows: Body compressed cylindrical, transparent, with red blood. In an individual of a fourth of an inch in length, without signs of division, there were forty-eight rings, or body segments, of which about a dozen posteriorly became successively more and more rudimental in the disappearance of the podal stylets and bristles. In specimens exhibiting evidence of division into a series of from two to four individuals, measuring up to half an inch in length, and stretching even to three-fourths of an inch or more, the number of rings together did not appear to be greater, and sometimes was

less, ranging from forty-two to forty-eight. Head ovoid, with the upper lip conical and more or less angular and obtuse. Eyeless. Caudal ring expanding into a broad, membranous, funnel-like pavilion, opening in a slanting manner dorsally and supporting eight divergent rays (see Fig. 1); anterior pair of rays papilliform; the others digitiform and successively increasing in length to the last pair. The rays are capable of extension beyond and retraction within the border of the pavilion, and this is also retractile, and when closed in the lateral view looks like the keeled prow of a boat. When the caudal pavilion is expanded, active ciliary motion is observed extending along the rays inwardly to the rectum, which motion most probably subserves a respiratory purpose.

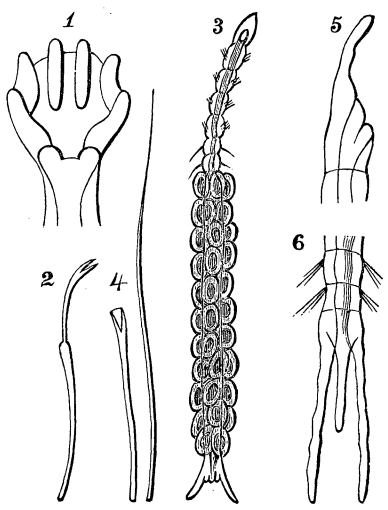


FIG. 1.—Caudal pavilion, with the rays not fully extended, of *Dero limosa*, viewed from above. FIG. 2.—A podal stylet. FIG. 3.—*Aulophorus vagus* within a tube composed of Plumatella statoblasts, magnified about six diameters. FIG. 4.—Spade-like podal stylet and bristle. FIG. 5.—Side view of the head of *Pristina flagellum*. FIG. 6.—Posterior extremity of the body of the same with its three caudal appendages.

The anterior four rings of the body are provided on each side with fascicles of four or five podal stylets, and the succeeding rings with fascicles of three or four stylets. The latter rings are also provided more dorsally on each side with additional fascicles mostly of a single stylet and a simple bristle. Stylets sigmoid with a median shoulder, and ending in a furcate hook (see Fig. 2).

Another of the little worms allied to the genus Dero, was collected together with some Plumatella scraped from a log in a ditch of the meadows below Philadelphia. It was in the latter part of September, and the water collected contained a great many detached statoblasts or winter eggs of the Plumatella. The worm first attracted my notice from the fact that it occupied a tube composed of the Plumatella eggs cemented together, and which it dragged about in the same manner as the larva of the Caddis does its case (see Fig. 3). The only worm of European waters which

appears to approximate this one, and which may prove to be the same, was described and figured a century and a quarter ago by the portrait painter naturalist, Rösel von Rosenhof, as the little supple water-serpent with two fork prongs—"*das geschmeidige Wasserschlänglein mit zwey Gabelspitzen*" (Insecten Belustigung, Nürnberg, 1755, Th. 3, 581, Tab. XCIII, Fig. 8–16). In character and habits it so closely accords with the genus Aulophorus of Schmarda (Neue wirbellose Thiere, 1861, II, 9), that I have referred it to a species of the same. Schmarda describes two species, *A. discocephalus* of Jamaica, and *A. oxycephalus* of Ceylon.

Our species I propose to name *Aulophorus vagus*. Its characters are as follow: Body compressed cylindrical, transparent, with red blood and yellowish-brown intestine. Single individuals of the third of an inch or more in length, composed of twenty-four to thirty-five rings. Head ovoid, extending as a conical upper lip, very mobile and changeable in form, obtuse or sub-acute, and minutely hirsute. Eyeless. Caudal ring contracted and furnished with a pair of long divergent digit-like appendages, which are straight or slightly incurved, blunt and minutely hirsute. Anal aperture surrounded by a rosette of half a dozen prominent, blunt, conical papillæ. The four rings succeeding the head furnished on each side with fascicles of seven to nine podal stylets; the succeeding rings, except the last, with fascicles of five to six podal stylets, which are shorter than the former. Podal stylets sigmoid, with a median shoulder, and ending in a furcate hook (Fig. 2). The same posterior rings furnished dorso-laterally with fascicles consisting each of usually a single moderately long bristle, and a single, nearly straight stylet, ending in a spade-like expansion (see Fig. 4).

Pharynx capacious, extending into the fifth ring, and narrowing into an œsophagus which ends in the intestine within the ninth ring. Generative organs unobserved. Worm of three to five lines in length, or more, according to its degree of extension. Living in a tube of its own construction which it drags about with it. The tube is composed of a transparent cement or basis incorporated with various materials, such as vegetal particles, sand, dirt, diatoms, spongilla spicules, etc. In creeping about among aquatic plants, Lemna and Wolffia, the worm stretches in such a manner that one-third of the body extends from the fore part of the tube, while the forked caudal extremity remains projected

from the back end. The worm moves in jerks, alternately extending the fore part of the body and projecting the podal fascicles forward and hooking into the surface on which it is creeping, and then contracting the fore part of the body and dragging along the back part enclosed within the tube. Frequently the motion is aided by the eversion of the pharynx, so as to form a disk or sucker which adheres to surfaces, like that of a leech. The movements occur in quick succession, so that the worm creeps about quite actively. At times the worm will double on itself and in this way pass through its tube and reverse its direction. At times too it will leave its tube and creep about without one. The papillæ of the anal aperture are clothed with vibratile cils, which produce an active current inwardly as observed in Dero.

Another little Naiad with conspicuous caudal appendages, in all other respects except in the possession of the latter, resembles Pristina, and I have therefore regarded it as such, with the name of *Pristina flagellum.* Its characters are as follow: Body compressed cylindroid, transparent, with red blood. In a specimen one-fourth of an inch long and exhibiting evidence of division into two individuals, there were about sixty rings, or thirty to each division. Head conical and prolonged into a digit-like upper lip (Fig. 5). Eyeless. Caudal ring furnished with three long digit-like, blunt appendages, trailing behind; the lateral pair nearly twice the length of the intermediate one (Fig. 6). Podal stylets in fascicles of four, on each side ventrally, to all the rings except the terminal ones; sigmoid with a median shoulder and ending in a furcate hook. Bristles to all the rings dorso-laterally, except the terminal ones, in fascicles of three to six.

Length of worm, 6 to 7 mm.; breadth 0.3 mm.; length of digit-like upper lip from the mouth, 0.25 mm.; length of lateral caudal appendages, 0.75 mm.; of intermediate one, 0.375 mm.; length of bristles, 0.25 to 0.375 mm. Creeping among aquatic plants in the ponds of sphagnous swamps, New Jersey and Pennsylvania.